CONCENTRATION OF CHLOROPHYLL 'A' IN CHENNAI COASTAL WATERS

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ABSTRACT

Coastal environment is a highly productive and economically important ecosystem. The oceans cover 71% of the earth surface and provide maximum benefit to human beings. The environmental conditions of coastal waters are largely governed by the seasonal and tidal cycles. Marine processes and food chains start with phytoplankton, which are chlorophyll-containing organisms. Nutrient enhancement in the seawater due to the discharge of agricultural, industrial, and urban wastes threatens the Sea environment. The different sampling stations of the coastal waters for the collection of water samples. The sampling stations were fixed based on the distance, accessibility and pollution load. The samples were collected and analysed for chlorophyll 'a'. During the month of December-2009, January-2010 and February-2010 in the following sampling stations. Ennore- Station-I, Harbour - Station-II, Coovum - Station-III, Marina - Station IV, Adyar - V and Thiruvanmiyur - VI. In the month of December station I and station IV showed higher chlorophyll 'a' levels when compared to other stations, control station showed highest level in January and February similar results were obtained, when compared to the other stations, but there was increased chlorophyll a level in all stations compared to December.

KEYWORDS: Chlorophyll 'A', Phytoplankton.

Original Article

INTRODUCTION

The importance of estuaries to humanity is enormous; more than 50% of the world's population lives within 60 km of the sea, most of the world's large parts are located in estuaries, and more than 90% of marine fish and other living resources are found in estuaries and the adjacent coastal waters (Alexander and Womer, 1999). In recent years, pollution of the coastal ecosystem has become a National and International problem because of its impact on living organisms, impairment on water quality for use, hindrance to aquaculture and human health. It is obvious that there are numerous complex and interlinked factors, which influence the health and growth of aquatic animals.

The fishing community is the link between the sea and land and adapted to the ecological niche. Through generations of interactions with the sea and nature, fisher folks have acquired skill in protecting, preserving, and using the ecosystems sustainable. They developed a variety of technologies tailored to the specific ecological niches along the coast. Dislocating or displacing them for industrial development will totally upset their livelihood, social structure and economic welfare leading to perennial conflicts and tensions. Hence, the eco-studies of the indigenous people is the need of the hour, it is not only physical environmental impact but also the social impact of developmental interventions need to be

assessed.

REVIEW OF LITERATURE

Phytoplanktons pigments (chlorophyll a, b, c and carotenoids) in Porto Novo waters (Vellar estuary) were studied by Krishnamurthy (1971). The diatoms and dinoflagellates were particularly dominant in summer and during the winter a variety of diatoms were suppressed, and a small raise in count was noticed. A close negative correlation was observed between silicon and salinity in velar estuary and the concentration of silicon was highest (upto 17 mg/1) in the upstream region of the estuary (Purushothaman and Venugopalan, 1972).

Bhargava and Dwivedi (1971) have made diurnal investigation by collecting samples at 3 hours intervals in Chennai Coastal Water. The phytoplankton pigments peaked during the mid day, when the tide and salinity were high. The difference between chlorophyll concentrations and oxygen levels were reported to be very marked and influenced by tidal conditions. Masiamons *et al*., (1999) reported that the low values of the chlorophyll pigments recorded in the months inspite of decreased nutrients availability in the coovum coastal waters in south Chennai is probably due to the low light penetration. Swami *et al.,* (2000) have reported low chlorophyll 'a' values (0.34–2.87 mg/m^3) throughout the year in Mumbai Harbour.

The frequent plankton in the Ria de ferrol estuary (Spain) were analysed by measuring changes in dissolved nutrient concentrations and plankton uptake rates. Dissolved inorganic nutrients oxygen, particulate and dissolved organic carbon and nitrogen along with chlorophyll 'a' concentration were measured in 3 stations representative of inner, middle and outer zones of the estuary (Bode *et.al.,* 2005). Kamala Kanta Sathpathy *et.al.,* 2008 studied variations of physico-chemical properties in Kalpakkam Coastal waters, east coast of India, during south west to north east monsoon transition period. A drastic decrease in chlorophyll 'a' concentration was observed in the coastal water during post transition period.

MATERIALS AND METHODS

Sampling Stations

The following are the different sampling stations of the coastal waters for the collection of water samples. The sampling stations were fixed based on the distance, accessibility and pollution load. The samples thus collected were analysed for its microbiological characteristics. During the month of December-2009, January-2010 and February-2010 in the following sampling stations.

Ennore - Station-I

Harbour - Station-II

Coovum - Station-III

Marina - Station-IV

Adyar - Station-V

Thiruvanmiyur -Station-VI

Chlorophyll "a" in phytoplanktons can be quantitatively estimated as it is important to study the growth and photosynthetic rates. Chlorophyll "a" is extractable completely in solvents like acetone/methanol, and exhibits characteristic absorption at 663nm.

RESULTS AND DISCUSSION

The results obtained by the water analysis of coastal area in the six sampling station were in the month of December station I and station IV showed higher chlorophyll 'a' levels when compared to other stations, control station showed highest level in January and February similar results were obtained, when compared to the other stations but there was increased chlorophyll 'a' level in all stations compared to December (Table -1, Figure -1).

Chlorophyll 'a' was high in station VI and IV. In the month of December due to less turbidity and increase light penetration in the station VI and IV, photosynthetic organisms could thrive well. Chlorophyll 'a' is an important photosynthetic pigment hence it was found to be higher in these stations. Station III and V showed decreased chlorophyll 'a' level in these stations were the sites of domestic waste discharge. This has increased the turbidity in water and decreased light penetration and hence could have lead to decreased photosynthetic activity. Station I and II the site of industrial discharge also showed decreased chlorophyll contents.

The significant increase in the chlorophyll 'a' level in all the stations could be due to the heavy rains at the end of December month which would have diluted the pollutants and increased the nutrient levels in coastal regions. Chlorophyll 'a' was reported to be positively correlated with salinity and was minimum in the monsoon months at the Chennai coastal waters as reported by (Subramanian and Mahadevan, 1999). Pulicat, Muttukadu, Uppanar velar and Coleroon estuaries had negative correlations between salinity and chlorophyll 'a'. In other estuaries there was no significant correlation. Chlorophyll 'a' levels were moderate to high (1 -27.3 mg/m^3) and the phytoplankton biomass increased along the salinity front but Telesh (2004) observed no reliable correlation between the salinity and diversity index in the river estuary, Gulf of Finland.

In the present investigation low chlorophyll 'a' values in the Coovum and Ennore has been supported by Sivaswamy (1990). He has concluded that of the various coastal regions of India viz, Cochin, Bombay, Goa and Porto Novo, the planktonic population is most affected in Madras Coast and also he related this to the city sewage and industrial effluents. Swami *et.al.,* (2000) have also reported low chlorophyll 'a' values (0.34 – 2.87 mg/m^3) throughout the year in Mumbai Harbour.

Table 1: Effect of Pollutants on Chlorophyll "A"(μg/Ml)

Month	Station I	Station II	Station III	Station IV	Station V	Station VI
Dec. 2009	435.73	423.1	378.9	473.62	442.05	495.88
Jan. 2010	442.05	448.36	416.79	479.94	454.68	517.83
Feb. 2010	448.36	454.67	423.1	498.99	473.62	536.77

FIG.1 EFFECT OF POLLUTANTS ON CHLOROPHYLL "a"
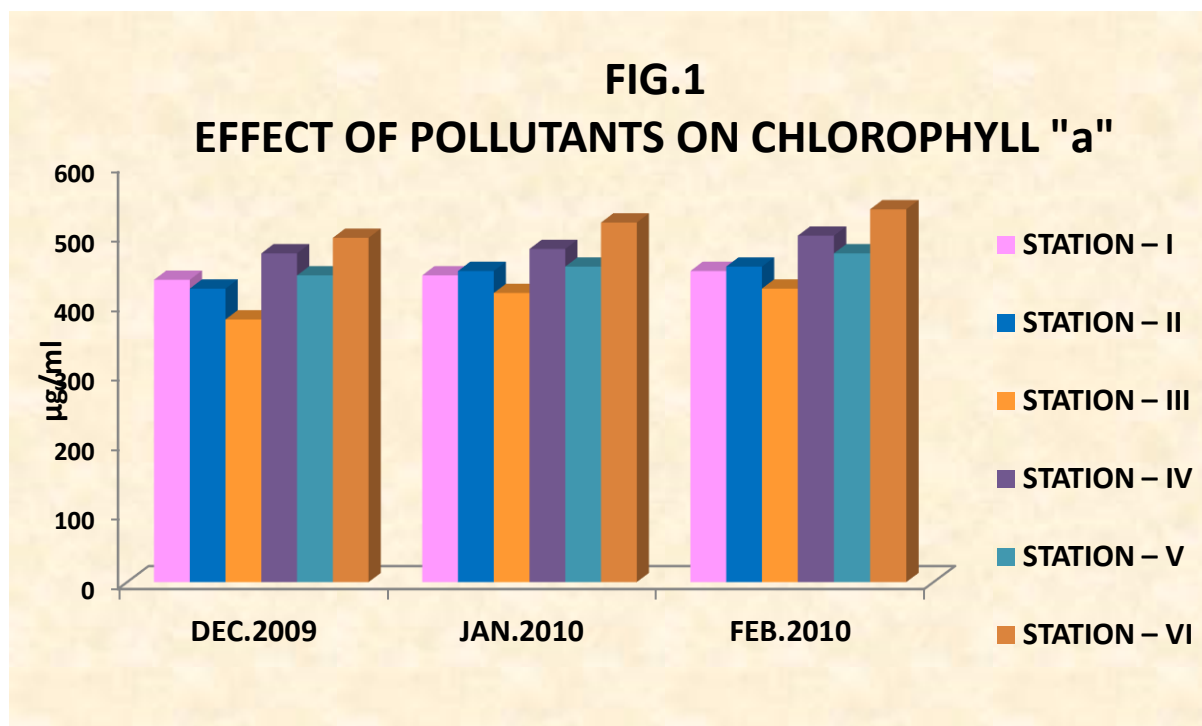
SUMMARY AND CONCLUSIONS

In the present study, it was found that when compared to all the six stations selected to check the pollution levels, station IV and VI were found to be less polluted as it is indicated by higher chlorophyll 'a' levels and increased level of phytoplankton activity. This indicates less pollution when compared to the other four stations selected along the coast of Chennai. Simultaneously, Adyar also showed decreased chlorophyll 'a' which could be due to domestic pollutants. Hence, care needs to be taken by authorities to prevent dumping of wastage in coastal waters, both in the industrial area and in the river Adyar. Public awareness needs to be created to maintain the quality of coastal area.

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